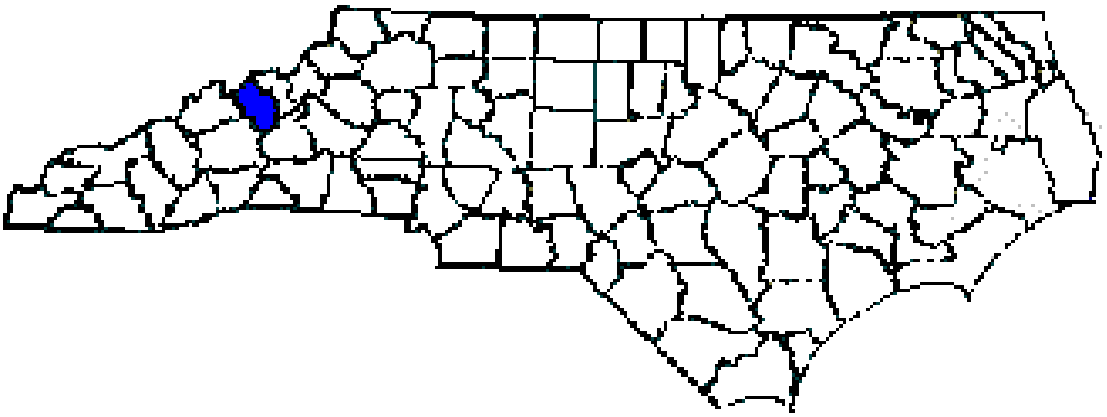
ANNUAL REPORT FOR 2015



UT to Cane River Site #12 Mitigation Site
Yancey County
TIP No. R-2518B
COE Action ID: SAW-2007-2197-357/300
DWR #: 20071134

Prepared By:
Natural Environment Section & Roadside Environmental Unit
North Carolina Department of Transportation
November 2015

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SUMMARY

The following report summarizes the stream monitoring activities that have occurred during the Year 2015 at the UT to Cane River Site #12 Mitigation Site in Yancey County. The North Carolina Department of Transportation (NCDOT) completed this project in March 2013. This report provides the monitoring results for the fourth formal year of monitoring (Year 2015). The Year 2015 monitoring period was the fourth of five scheduled years of monitoring on the UT to Cane River Site #12 Mitigation Site (See Success Criteria Section 2.1).

Based on the overall conclusions of monitoring at UT to Cane River Site #12, it has met the required monitoring protocols for the fourth formal year of monitoring on the stream and the planted vegetation. The ACOE and NCDWR agreed with NCDOT to not complete the longitudinal profile survey for the remainder of the five year monitoring period due to mature hardwood vegetation along the channel. In lieu of doing the longitudinal profile, visual inspection of the channel stability throughout the reach and photo documentation at the permanent photo point locations would be completed. All other monitoring activities will continue to be completed throughout the five year monitoring period. The channel throughout the stream enhancement site is stable at this time. The streambank was planted with live stakes in March 2012 and the buffer was planted with bareroot seedlings in April 2012. The planted vegetation is surviving at this time.

NCDOT proposes to continue stream and vegetation monitoring at the UT to Cane River Site #12 Mitigation Site in 2016.

1.0 INTRODUCTION

1.1 Project Description

The following report summarizes the stream monitoring activities that have occurred during the Year 2015 at the UT to Cane River Site #12 Mitigation Site. Site #12 is located on US 19 in Yancey County at Sta. 223+66 to Sta. 225+46 -L- (Figure 1). The UT to Cane River Site #12 was constructed to provide mitigation for stream impacts associated with Transportation Improvement Program (TIP) number R-2518B in Yancey County.

The mitigation site provided approximately 584 linear feet of stream enhancement. Construction was completed during March 2012 by the NCDOT. Stream enhancement involved installing several in-stream cross vane structures and planting the riparian buffer zone.

1.2 Purpose

In order for a mitigation site to be considered successful, the site must meet the success criteria. This report details the monitoring in 2015 at the UT to Cane River Site #12 Mitigation Site. Hydrologic monitoring was not required for this site.

1.3 Project History

March 2012	Construction Completed
March 2012	Site Planted (Type I Only)
April 2012	Site Planted (Type II Only)
April 2012	As-Built Survey Completed
September 2012	Vegetation Monitoring (Year 1)
November 2012	Stream Channel Monitoring (Year 1)
March 2013	Bankfull Monitoring Gauge Installed
August 2013	Vegetation Monitoring (Year 2)
November 2013	Stream Channel Monitoring (Year 2)
July 2014	Vegetation Monitoring (Year 3)
November 2014	Stream Channel Monitoring (Year 3)
July 2015	Vegetation Monitoring (Year 4)
November 2015	Stream Channel Monitoring (Year 4)

1.4 Debit Ledger

The entire UT to Cane River Site #12 stream mitigation site was used for the R-2518B project to compensate for unavoidable stream impacts.

Figure 1. Vicinity Map

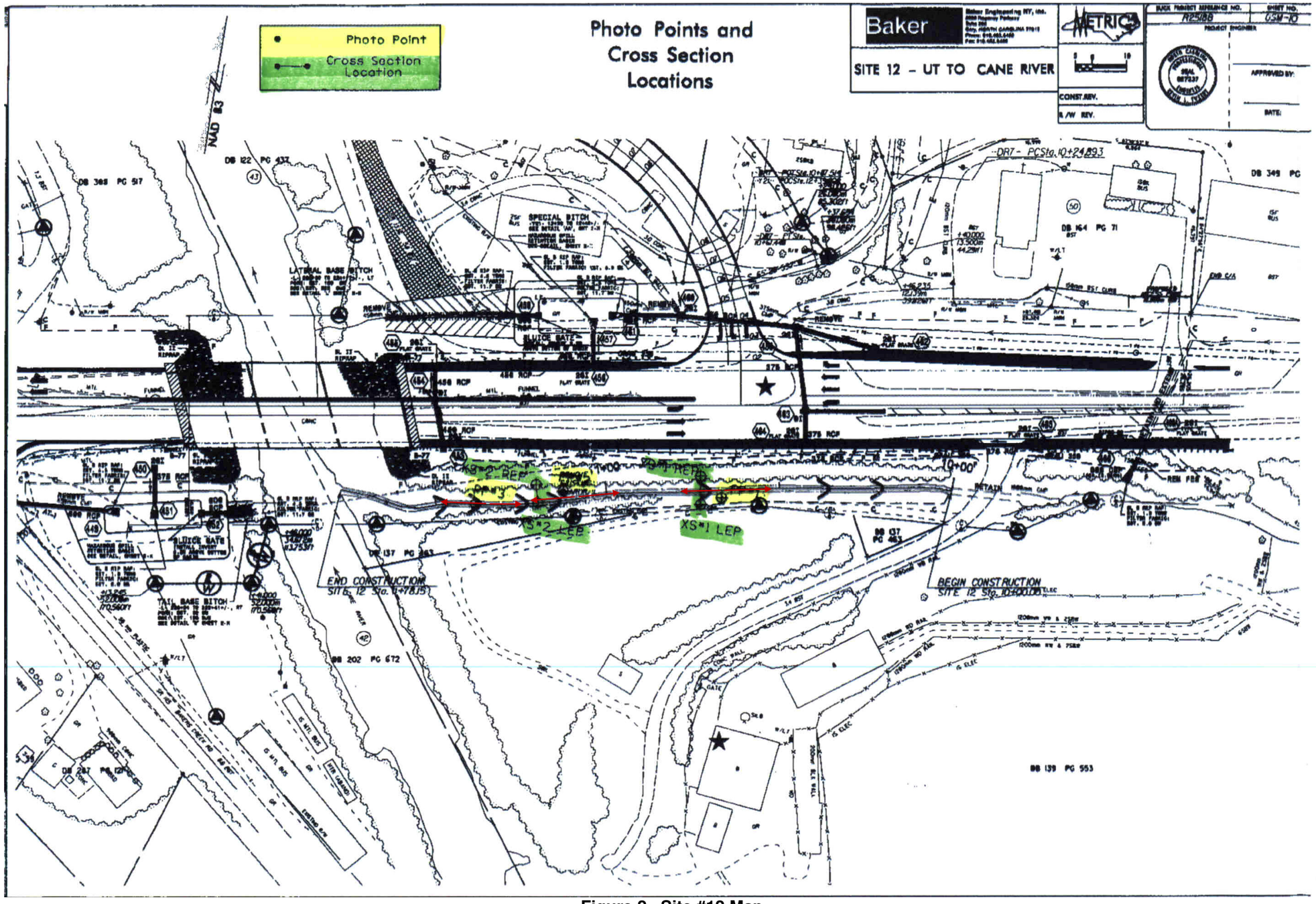


Figure 2. Site #12 Map

PROJECT REFERENCE NO.	SHEET NO.
R-2518B	RF-9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

STREAMBANK REFORESTATION FOR SITE 12

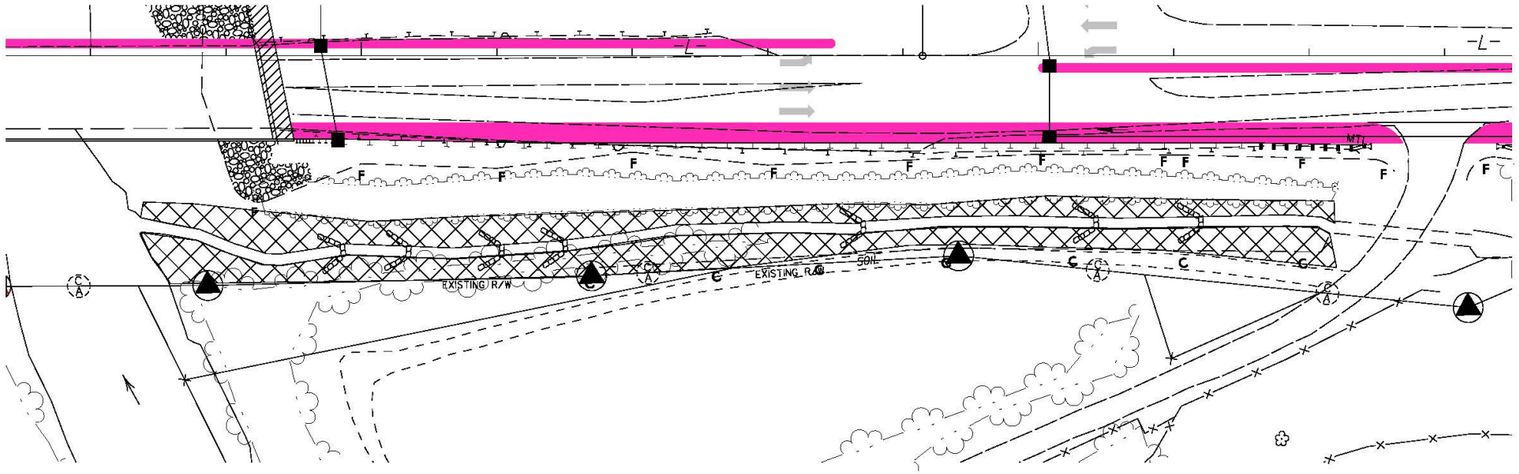


Figure 3. Site #12 Reforestation Plan

2.0 STREAM ASSESSMENT

2.1 Success Criteria

The permittee shall monitor the restoration and enhancement mitigation sites following the Level 1 protocols outlined in the "Stream Mitigation Guidelines," dated April 2003 with the following exceptions:

1. Pebble counts shall not be conducted.

2. Two cross sections shall be conducted for streams less than 500 linear feet and five (5) cross sections shall be conducted for streams greater than 500 linear feet.

3. Riparian success shall be by visual inspection of plant survival. Photos will be taken and comments noted on plant survival.

The permittee shall monitor the preservation sites by visual inspection. Photos will be taken and comments noted on plant survival. The monitoring shall be conducted annually for a minimum of five (5) years after final planting. The monitoring results shall be submitted to DWR in a final report within sixty (60) days after completing monitoring. After 5 years the NCDOT shall contact the DWR to schedule a site visit to "close out" the mitigation site.

2.2 Stream Description

2.2.1 Post-Construction Conditions

The enhancement of UT to Cane River Site #12 Mitigation Site involved installing several in-stream cross vane structures and planting the riparian buffer zone.

2.2.2 Monitoring Conditions

The objective of the UT to Cane River Site #12 stream enhancement was to enhance a B4 stream as identified in Rosgen's Applied River Morphology. A total of two cross sections (one riffle and one pool) were surveyed. For this report, only cross sections containing riffles were used in the comparison of channel morphology presented below in Table 1 (Site #12).

Table 1. Abbreviated Morphological Summary (UT to Cane River Site #12)

Variable	Proposed	Cross-Section #2 (Riffle)	Cross-Section #2 (Riffle)	Cross-Section #2 (Riffle)	Cross-Section #2 (Riffle)	Cross-Section #2 (Riffle)
		2012	2013	2014	2015	2016
Drainage Area (mi^2)	**0.70**	0.70	0.70	0.70	0.70	
Bankfull Cross Sectional Area (ft^2)	**10**	7.2	9.95	9.47	8.75	
Maximum Bankfull Depth (ft.)	**1.1**	0.88	1.79	1.74	1.49	
Width of the Floodprone Area (ft.)	**35**	13.03	16.64	16.34	15.49	
Bankfull Mean Depth (ft.)	**0.8**	0.66	0.94	0.92	0.86	
Width/Depth Ratio	**14**	16.5	11.22	11.16	11.87	
Entrenchment Ratio	**3**	1.2	1.58	1.59	1.52	
Bankfull Width (ft.)	**11.8**	10.89	10.55	10.27	10.21	

* Riffle values are used for classification purposes, pool values are shown in Appendix A.

2.3 Results of the Stream Assessment

2.3.1 Site Data

The assessment included the survey of two cross sections of the UT to Cane River Site #12 established by NCDOT after construction. Two cross sections were established during the as-built monitoring year. Cross section locations were subsequently based on the stationing of the longitudinal profile and are presented below. The locations of the cross sections are shown in Appendix A.

UT to Cane River Site #12 Cross-Sections:

- Cross-Section #1: UT to Cane River Site #12, Sta. 237+00, midpoint of pool
- Cross-Section #2: UT to Cane River Site #12, Sta. 397+00 midpoint of riffle

Based on comparisons of the As-Built to the monitoring data, all of the cross sections appear stable with little or no active bank erosion. Graphs of the cross sections are presented in Appendix A. Future survey data will vary depending on actual location of rod placement and alignment; however, this information should remain similar in appearance.

The ACOE and NCDWR agreed with NCDOT to not complete the longitudinal profile survey for the remainder of the five year monitoring period due to mature hardwood vegetation along the channel. In lieu of doing the longitudinal profile, visual inspection of the channel stability throughout the reach and photo documentation at the permanent photo point locations would be completed. All other monitoring activities will continue to be completed throughout the five year monitoring period. Photo points 1 through 3 showed the mature hardwood vegetation along the channel. The channel bed is stable throughout the stream site at this time. Pebble counts were not required per the permit conditions and therefore were not completed. Multiple bankfull events were documented by a surface water gauge at Site 12 during the 2013 and 2014 monitoring years.

3.0 VEGETATION: UT to Cane River Site #12

3.1 Description of Species

The following tree species were planted on the streambank:

Salix nigra, Black Willow

Cornus amomum, Silky Dogwood

The following tree species were planted in the buffer area:

Liriodendron tulipifera, Yellow Poplar

Platanus occidentalis, Sycamore

Fraxinus pennsylvanica, Green Ash

Quercus alba, White Oak

3.2 Results of Vegetation Monitoring

Streambank & Buffer Vegetation: The streambank reforestation was completed in March and April 2012. The Year 4 vegetation monitoring evaluation noted: Type I: Black Willow, Silky Dogwood and Type II: Green Ash were surviving at the time of the monitoring evaluation. The existing vegetation is already providing a canopy of hardwood vegetation along the reach.

3.3 Conclusions

NCDOT will continue to monitor the planted vegetation in 2016.

4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

The UT to Cane River Site #12 Mitigation Site has met the required monitoring protocols for the fourth formal year of monitoring on the stream and the planted vegetation. The channel throughout the stream enhancement site is stable at this time. The planted vegetation is surviving at this time.

NCDOT proposes to continue stream and vegetation monitoring at the UT to Cane River Site #12 Mitigation Site in 2016.

5.0 REFERENCES

Stream Mitigation Plan, US Highway 19, R-2518B On-Site Mitigation Yancey County, North Carolina, February 2007.

Design Plans for R-2518B, US 19 from east of the Madison County line to SR 1336, Stream Mitigation (Preservation, Enhancement, and Restoration), Buck Engineering.

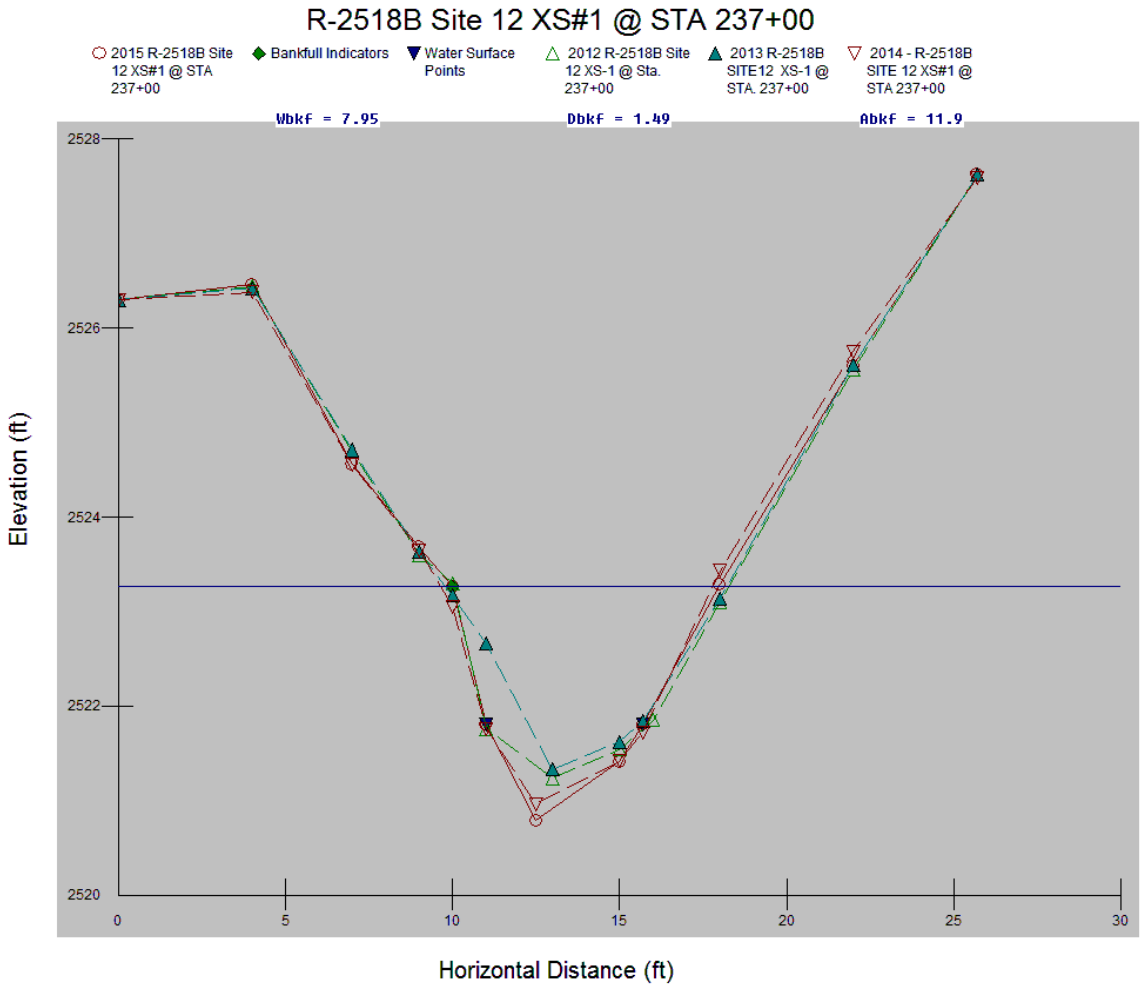
North Carolina Department of Transportation (NCDOT), April 29, 2008. 404 and 401 Individual Permits for R-2518A and R-2518B (ACOE Permit No. 2007-2197-357/300 and DWR Project No. 20071134, Individual Certification No. 3706).

Rosgen, D.L, 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

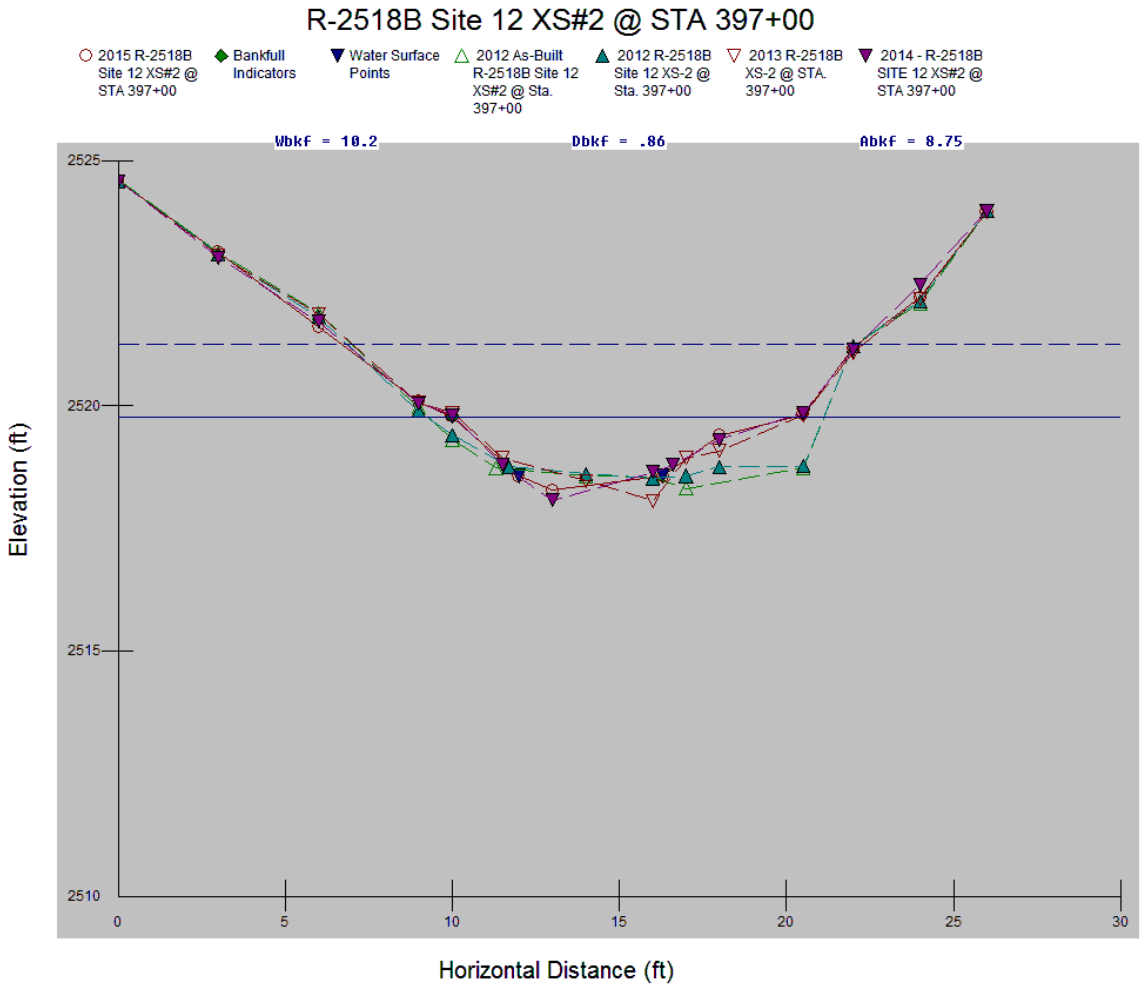
US Army Corps of Engineers (USACE), 2003. Stream Mitigation Guidelines. Prepared with cooperation from the US Environmental Protection Agency, NC Wildlife Resources Commission, and the NC Division of Water Quality.

APPENDIX A

CROSS SECTIONS



Site #12: Cross-Section #1 (Pool) Abbreviated Morphological Summary					
	2012	2013	2014	2015	2016
Bankfull Cross Sectional Area (ft^2)	11.48	8.57	10.06	11.88	
Maximum Bankfull Depth (ft.)	2.06	1.84	2.09	2.47	
Bankfull Mean Depth (ft.)	1.38	1.06	1.34	1.49	
Bankfull Width (ft.)	8.33	8.05	7.49	7.95	



Site #12: Cross-Section #2 (Riffle) Abbreviated Morphological Summary					
	2012	2013	2014	2015	2016
Bankfull Cross Sectional Area (ft^2)	7.2	9.95	9.47	8.75	
Maximum Bankfull Depth (ft.)	0.88	1.79	1.74	1.49	
Width of the Floodprone Area (ft.)	13.03	16.64	16.34	15.49	
Bankfull Mean Depth (ft.)	0.66	0.94	0.92	0.86	
Width/Depth Ratio	16.5	11.22	11.16	11.87	
Entrenchment Ratio	1.2	1.58	1.59	1.52	
Bankfull Width (ft.)	10.89	10.55	10.27	10.21	

*According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width depth ratio are not measured in pool, glide, or run features

APPENDIX B

SITE PHOTOGRAPHS

UT to Cane River Site #12

Photo Point #1 (Upstream)

Photo Point #1 (Downstream)

Photo Point #2 (Upstream)

Photo Point #2 (Downstream)

Photo Point #3 (Upstream)

Photo Point #3 (Downstream)

November 2015

UT to Cane River Site #12

Vegetation Overview Photo (North Buffer)

Vegetation Overview Photo (South Buffer)

August 2015